

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SUMITOMO METAL  
MINING CO LTD

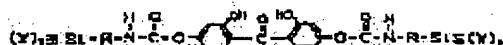
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(72)Inventor : TANAKA HIROYUKI  
KUNO HIROKO  
ADACHI KENJI

**(54) COATING LIQUID FOR FORMING HEAT-RAY AND ULTRAVIOLET-RAY SHIELDING FILM, AND HEAT-RAY AND ULTRAVIOLET-RAY SHIELDING FILM PREPARED BY USING THE LIQUID**

(57)Abstract:

**PROBLEM TO BE SOLVED:** To obtain a coating liquid for forming heat-ray and ultraviolet-ray shielding film applicable to a transparent base material and capable of forming a coating film at normal temperature by compounding a specific near infrared ray-shielding material, a specific curing ultraviolet ray absorbing agent, a diluting solvent and a curing catalyst, to enable normal temperature curing.



**SOLUTION:** This coating liquid is obtained by compounding (A) a near infrared ray-shielding material consisting of fine particles of a hexaboride compound (one kind or more kinds selected from CeB<sub>6</sub>, GdB<sub>6</sub>, TbB<sub>6</sub>, DyB<sub>6</sub>, HoB<sub>6</sub>, YB<sub>6</sub>, SmB<sub>6</sub>, EuB<sub>6</sub>, ErB<sub>6</sub>, TmB<sub>6</sub>, YbB<sub>6</sub>, LuB<sub>6</sub>, SrB<sub>6</sub>, CaB<sub>6</sub>, LaB<sub>6</sub>, PrB<sub>6</sub> and NdB<sub>6</sub>) having an average particle diameter of 200 nm or less, (B) a curing ultraviolet ray absorbing agent containing

a compound of the formula (X is an alkoxyl forming a silanol by hydrolysis; R is a 1-3C alkylene chain) obtained by reacting 2,2',4,4'-tetrahydroxybenzophenone with an alkoxy silane having an isocyanate group in the presence of a catalyst, (C) a diluting solvent and (D) a curing catalyst, to enable normal temperature curing.

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## LEGAL STATUS

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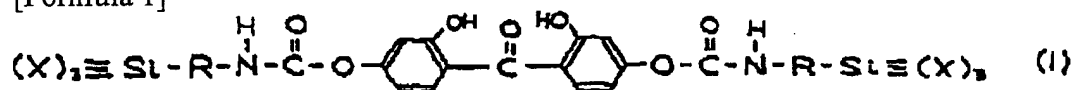
## CLAIMS

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[Claim(s)]

[Claim 1] The heat ray and application liquid for ultraviolet-rays cover film formation characterized by providing the following. Near-infrared light shielding material. Hardenability ultraviolet ray absorbent. Diluent solvent. A curing catalyst is contained and they are the heat ray and the application liquid for ultraviolet-rays cover film formation which can be hardened in ordinary temperature. This near-infrared light shielding material It consists of a 6 boride (1 or more of CeB<sub>6</sub>, GdB<sub>6</sub>, TbB<sub>6</sub>, DyB<sub>6</sub>, HoB<sub>6</sub>, YB<sub>6</sub>, SmB<sub>6</sub>, EuB<sub>6</sub>, ErB<sub>6</sub>, TmB<sub>6</sub>, YbB<sub>6</sub>, LuB<sub>6</sub>, SrB<sub>6</sub>, CaB<sub>6</sub>, LaB<sub>6</sub>, PrB<sub>6</sub>, and NdB<sub>6</sub> sorts) particle of 200nm or less of mean particle diameters. This hardenability ultraviolet ray absorbent is a hardenability ultraviolet ray absorbent shown by the general formula (1) which 2, 2', and 4 and a 4'-tetrapod hydroxy benzophenone and alkoxysilane with an iso cyano group were made to react under existence of a catalyst, and was obtained at least.

[Formula 1]



However, X in a general formula (1) shows the alkoxy group which produces a silanol by hydrolysis, and R in a general formula (1) shows the alkylene chain of carbon numbers 1-3.

[Claim 2] The heat ray and application liquid for ultraviolet-rays cover film formation according to claim 1 whose content of the aforementioned hardenability ultraviolet ray absorbent is 0.5 - 53wt% to application liquid.

[Claim 3] The heat ray and application liquid for ultraviolet-rays cover film formation according to claim 1 or 2 which contains further CeO<sub>2</sub>, ZnO, Fe<sub>2</sub>O<sub>3</sub>, and the inorganic ultraviolet-rays cover component of the particle of 100nm or less of mean particle diameters that consists of one or more sorts in FeOOH.

[Claim 4] A heat ray and application liquid for ultraviolet-rays cover film formation given in any of acrylic resin or/and the claim 1 containing colloidal silica - a claim 3 they are further as a solid content.

[Claim 5] The heat ray and ultraviolet-rays cover film which applies a heat ray and the application liquid for ultraviolet-rays cover film formation according to claim 1 to 4 to a base material, hardens, and is obtained.

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[Translation done.]

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to glass, plastics, and a heat ray and an ultraviolet-rays shielding material applicable to the transparent base material which needs other heat ray and ultraviolet-rays cover functions, and relates to the heat ray and ultraviolet-rays cover film which formed the specific wavelength of sunrays in more detail using the heat ray, the application liquid for ultraviolet-rays cover film formation, and this in which room temperature setting is possible including the component absorbed or reflected alternatively.

[0002]

[Description of the Prior Art] A near infrared ray (heat ray), a visible ray, and ultraviolet rays are large to three, and sunrays are divided. Among these, the near infrared ray of a long wavelength field is a light sensed for a human body as heat energy, and causes a temperature rise the interior of a room and in the car. moreover, the ultraviolet rays of a short wavelength field -- the bad influence to human bodies, such as suntan, a stain, oncogenesis, and an eyesight obstacle, -- it is -- moreover, the fall of the mechanical strength of goods -- fading -- etc. -- appearance degradation, food degradation, the color tone fall of printed matter, etc. are caused

[0003] In order to cover simultaneously these unnecessary heat rays and detrimental ultraviolet rays, a heat ray and an ultraviolet-rays cover film are formed on a base material, and the glass which has a heat ray and an ultraviolet-rays cover function, plastics, the film, etc. are used.

[0004] Although the metallic material which has conduction electron, such as noble metals (Au, Ag, etc.), copper (Cu), a titanium nitride (TiN), and aluminum (aluminum), so much was used for the conventional heat ray and ultraviolet-rays cover film, with such material, not only a near infrared ray but the light of a light field had the property reflected or absorbed simultaneously, and there was a fault that a visible light transmittance was low. For this reason, when such material was used for transparent base materials, such as building materials, a vehicle, and a telephone booth, thickness needed to be made thin in order to make the permeability of a light field high.

[0005] Usually, although the sputtering method and the vacuum deposition were used for formation of the thin film using such material, by these methods, since large-scale vacuum devices were needed, it was inferior to productivity, and the membranous manufacturing cost became high. Moreover, membrane formation of a large area was difficult.

[0006] By forming a cover film on a base material using the application liquid containing a heat ray and an ultraviolet-rays shielding material, easy and the base material which has a heat ray and an ultraviolet-rays cover function by the low cost can be manufactured. For example, although development of the application liquid which distributed the particle more detailed 1 or more figures than the wavelength of light is tried, in the above-mentioned conventional metallic material, it becomes [ oxidization by atomization poses a problem and / cost ] high in use of Au and is not desirable.

[0007] Moreover, a visible light transmittance is high and an antimony content tin oxide (ATO), tin content indium oxide (ITO), etc. are known as a material with a heat ray cover function. Not much greatly, although turning minutely and making this into application liquid is also performed, in order to obtain sufficient heat ray shielding effect, a lot of addition is required for the cover ability of near-infrared light, and cost becomes high. Moreover, since film intensity fell greatly, it was not practical.

[0008] The aperture of a building, the windowpane of an automobile, etc. can form a heat ray and an ultraviolet-rays cover film using the application liquid which contains a heat ray and an ultraviolet-rays shielding material also to the base material already used, and can give a heat ray and an ultraviolet-rays cover function. When forming a heat ray and an ultraviolet-rays cover film to the base material already used, in ordinary temperature, if hardening is possible, it is not necessary to prepare equipment special to hardening, and is advantageous. Thus, although application spread when the film with which room temperature setting is possible for application liquid with the film, and it moreover covers a heat ray and ultraviolet rays could be formed, such application liquid was not known.

[0009] As an ultraviolet ray absorbent, it considers as the transparent material which absorbs the ultraviolet rays of a short wavelength field efficiently, and organic ultraviolet ray absorbents, such as a benzophenone and a benzotriazol, are known. These ultraviolet ray absorbents cannot form a paint film independently, but are usually used as an additive. When it was used for a long period of time, evapotranspiration etc. took place, and these ultraviolet ray absorbents had the problem on which the ultraviolet-rays cover ability of a base material deteriorates. For this reason, in order to make the ultraviolet-rays cover ability of a base material maintain for a long time, it was required to use an ultraviolet ray absorbent so much.

[0010] Since the ultraviolet ray absorbent would have oozed out enough (this is called "bleed out" below.) on the front face and cloudiness would arise in a base material if a lot of ultraviolet ray absorbents are used, to the purpose of paint film formation, it had become the obstacle of utilization.

[0011]

[Problem(s) to be Solved by the Invention] Then, the heat ray and ultraviolet-rays cover ability of this invention which can solve the trouble of the above-mentioned conventional technology, can apply to a transparent base material, and can be formed using the heat ray, the application liquid for ultraviolet-rays cover film formation, and this in which paint film formation in ordinary temperature is possible is high, and it aims at offering a heat ray and an ultraviolet-rays cover film without the bleed out of an ultraviolet ray absorbent.

[0012]

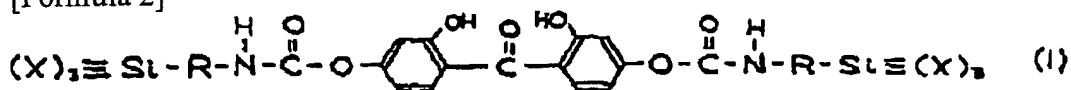
[Means for Solving the Problem] In order that artificers may solve the above-mentioned conventional trouble, they compound the constituent which contains a hardenability ultraviolet ray absorbent as an ultraviolet-rays shielding material further paying attention to a 6 boride particle like LaB<sub>6</sub> or GdB<sub>6</sub> which holds a free electron so much as a near-infrared light shielding material, and came to invent the heat ray, the application liquid for ultraviolet-rays cover film formation, and the heat ray and the ultraviolet-rays cover film containing these.

[0013] Namely, the heat ray and the application liquid for ultraviolet-rays cover film formation of this invention A near-infrared light shielding material, a hardenability ultraviolet ray absorbent, a diluent solvent, and a curing catalyst are contained. They are the heat ray and the application liquid for ultraviolet-rays cover film formation which can be hardened in ordinary temperature. this near-infrared light shielding material It consists of a 6 boride (1 or more of CeB<sub>6</sub>, GdB<sub>6</sub>, TbB<sub>6</sub>, DyB<sub>6</sub>, HoB<sub>6</sub>, YB<sub>6</sub>, SmB<sub>6</sub>, EuB<sub>6</sub>, ErB<sub>6</sub>, TmB<sub>6</sub>, YbB<sub>6</sub>, LuB<sub>6</sub>, SrB<sub>6</sub>, CaB<sub>6</sub>, LaB<sub>6</sub>, PrB<sub>6</sub>, and NdB<sub>6</sub> sorts) particle of 200nm or less of mean particle diameters. It is characterized by this hardenability ultraviolet ray

absorbent containing the hardenability ultraviolet ray absorbent shown by the general formula (1) which 2, 2', and 4 and a 4'-tetrapod hydroxy benzophenone and alkoxy silane with an iso cyano group were made to react under existence of a catalyst, and was obtained at least.

[0014]

[Formula 2]



[0015] However, X in a general formula (1) shows the alkoxy group which produces a silanol by hydrolysis, and R in a general formula (1) shows the alkylene chain of carbon numbers 1-3.

[0016] For example, a methoxy machine, an ethoxy basis, a propoxy group, a butoxy machine, etc. are mentioned to alkoxy-group X which produces a silanol by hydrolysis.

[0017] As for the content of the aforementioned hardenability ultraviolet ray absorbent, it is desirable that it is 0.5 - 53wt% to application liquid.

[0018] Moreover, you may make aforementioned heat ray and application liquid for ultraviolet-rays cover film formation contain further CeO<sub>2</sub>, ZnO, Fe<sub>2</sub>O<sub>3</sub>, and the inorganic ultraviolet-rays cover component of the particle of 100nm or less of mean particle diameters that consists of one or more sorts in FeOOH.

[0019] Moreover, you may include acrylic resin or/, and colloidal silica in aforementioned heat ray and application liquid for ultraviolet-rays cover film formation further as a solid content.

[0020] Moreover, the heat ray and ultraviolet-rays cover film of this invention apply the heat ray and the application liquid for ultraviolet-rays cover film formation of one of the above to a base material, hardens, and is obtained.

[0021]

[Embodiments of the Invention] The near-infrared light shielding material in the heat ray, the application liquid for ultraviolet-rays cover film formation, and the film of this invention is 6 boride (CeB<sub>6</sub>, GdB<sub>6</sub>, TbB<sub>6</sub>, DyB<sub>6</sub>, HoB<sub>6</sub>, YB<sub>6</sub>, SmB<sub>6</sub>, EuB<sub>6</sub>, ErB<sub>6</sub>, TmB<sub>6</sub>, YbB<sub>6</sub>, LuB<sub>6</sub>, SrB<sub>6</sub>, CaB<sub>6</sub>, LaB<sub>6</sub>, PrB<sub>6</sub>, NdB<sub>6</sub>) particle, are one-sort independent [ these ], or they are used for two or more sorts, being mixed

[0022] Although these 6 boride particle is powder which presents a dark purple-blue color etc., particle size is small enough compared with visible light wave length, and visible light-transmission nature arises on a film in the state where it distributed in the thin film. However, the cover ability of infrared light can be held sufficiently strongly. According to the experiment, by the film which distributed these particles sufficiently finely and uniformly, having the maximal value, while permeability is the wavelength of 400-700nm, and having the minimal value among 700-1800nm is observed. If visible light wave length takes into consideration that it is 380-780nm and visibility is campanulate [ with a peak of near 550nm ], by such film, he can understand penetrating the light effectively, and absorbing and reflecting light of the other wavelength effectively.

[0023] The mean particle diameter of 6 boride particle has good 200nm or less, and its 100nm or less is more desirable. It is because the condensation inclination of particles will become strong and will cause [ of the particle in application liquid ] sedimentation, if

a mean particle diameter exceeds 200nm. Moreover, since existence of the particles exceeding 200nm or those big and rough particles that were condensed causes a visible light-transmittance fall by light scattering by it, it is not desirable.

[0024] Although 6 boride particle has the cover ability of a near infrared ray and ultraviolet rays, absorption of ultraviolet rays is comparatively small. For this reason, in order to give sufficient ultraviolet-absorption ability, addition of an ultraviolet ray absorbent is required.

[0025] The hardenability ultraviolet ray absorbent in this invention is the reactant which 2, 2', and alkoxy silane with iso cyano groups, such as 4, a 4'-tetrapod hydroxy benzophenone and gamma-isocyanate propyltrimethoxysilane, and gamma-isocyanate propyl triethoxysilane, are made to react under existence of catalysts, such as dibutyltin dilaurate, dibutyltin dioctoate, and dioctyl tin dilaurate, and is compounded, and is expressed with a general formula (1).

[0026] The hardenability ultraviolet ray absorbent of this invention has the skeleton of a benzophenone system in a molecule, and this contributes it to absorption of ultraviolet rays. Moreover, the alkoxy group of a molecule edge is understood an added water part, produces a reactant high silanol, and when this carries out a condensation polymerization, it is combinable with macromolecule-izing or other binder components in person. In addition, an alkoxy group understands this hardenability ultraviolet ray absorbent an added water part, and it may exist also with the gestalt of the oligomer in which the silanol carried out the condensation polymerization.

[0027] Although the heat ray and the application liquid for ultraviolet-rays cover film formation of this invention contain at least one kind of this hardenability ultraviolet ray absorbent, the hardening takes place by macromolecule-ization by hydrolysis of the ARUKOSHIKIRU machine of a hardenability ultraviolet ray absorbent, and the condensation polymerization of the silanol following it, and other binder components are not indispensable. Thus, in order that the ultraviolet ray absorbent itself may carry out a polymerization and it may form a strong paint film, there is no bleed out of an ultraviolet ray absorbent.

[0028] Moreover, although there is moisture hardenability in this hardenability ultraviolet ray absorbent, in order to make the cure rate in ordinary temperature practical, addition of a curing catalyst is indispensable. As a curing catalyst, general acid catalysts, such as Para toluenesulfonic acid, can be used.

[0029] Especially the diluent solvent in a heat ray and the application liquid for ultraviolet-rays cover film formation is not limited, and is selectable according to application conditions and the kind of solid content in application environment and application liquid. For example, various solvents, such as ketones, such as ester, such as ether alcohols, such as alcohols, such as a methanol, ethanol, and isobutyl alcohol, an ethylene glycol monomethyl ether, and ethylene glycol monoethyl ether, methyl acetate, and ethyl acetate, a methyl ethyl ketone, and a cyclohexanone, are usable. Moreover, you may use it combining one sort or two sorts or more of solvents by the use.

[0030] Moreover, when not using together with inorganic ultraviolet ray absorbents, such as ZnO, CeO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, and FeOOH, as for the content of the compost containing the hardenability ultraviolet ray absorbent in application liquid, it is desirable that it is 12 - 53wt%. If the ultraviolet-rays cover ability of the heat ray and ultraviolet-rays cover film obtained by carrying out application hardening to a content being less than [ 12wt% ] is

low and exceeds 53wt%, even when not adding other solid contents, the viscosity of application liquid rises and application nature gets worse.

[0031] However, when it uses together with inorganic ultraviolet ray absorbents, such as ZnO, CeO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, and FeOOH, and is used, the concentration in application liquid may be lower than this, and is usable as application liquid for solar radiation cover film formation which is practical enough also by 0.5 - 12wt% addition concentration.

[0032] as the solid content in application liquid -- organic resins, such as acrylic resin and a urethane resin, colloidal silica, and aluminum<sub>2</sub> -- O<sub>3</sub>, TiO<sub>2</sub>, the inorganic ultrafine particle of ZrO<sub>2</sub> grade, various silane coupling agents, etc. -- one sort -- or two or more sorts may add Improvement of the application nature of application liquid, improvement of the degree of hardness of an application film, improvement of the adhesion force to a base material, etc. accomplish by this.

[0033] The heat ray and ultraviolet-rays cover film which has ultraviolet-rays cover ability stable for a long period of time on a base material can be formed by applying the application liquid of this invention to base materials, such as glass, a plastic sheet, and a film, and making it harden in ordinary temperature. Especially the methods of application of application liquid may not be limited, and what method is sufficient as them as long as they are the methods of applying liquid uniformly thinly evenly, such as the spin coat method, a spray coating method, a dip coating method, screen printing, and a method with cloth or the brush.

[0034] The heat ray and ultraviolet-rays cover film formed on the base material suppress degradation by the ultraviolet rays of the base material itself while giving a heat ray and an ultraviolet-rays cover function stable for a long period of time to a base material.

[0035]

[Example] The example of this invention and the example of comparison are shown below, and this invention is explained to it still in detail.

[0036] Example 1 ... 10g [ of LaB<sub>6</sub> particles ] (67nm of mean particle diameters) and diacetone alcohol 86g and 4g of coupling agents for particle distribution were mixed, ball mill mixture was performed for 150 hours using the zirconia ball with a diameter of 4mm, and 100g of dispersion liquid of LaB<sub>6</sub> particle was produced (A liquid).

[0037] 1g of dibutyltin dilaurate was added for 2, 2', 4, and 4'-tetrapod hydroxy benzophenone 57g and gamma-isocyanate propyl triethoxysilane 77g for the beaker, and mixed stirring was performed by the mechanical stirrer. Although exothermic reaction occurred, neglect cooling was carried out as it was for about 1 hour, and the liquid of the dark reddish-brown containing the reactant target ultraviolet ray absorbent and hyperviscosity was obtained (synthetic liquid 1).

[0038] 13. Mixed stirring of the synthetic liquid [ of 5 g / 1 and 13.1g ] ethanol was carried out, and it dissolved uniformly. Furthermore, ethylene-glycol-monomethyl-ether 43g and ethylene-glycol-monobutyl-ether 25g were added as a solvent, 0.4g (monohydrate) of Para toluenesulfonic acid was added as a curing catalyst, and mixed stirring was carried out. Furthermore 5g of A liquid was added, mixed stirring was carried out, and a heat ray and the application liquid for ultraviolet-rays cover film formation were obtained. The solid content of application liquid is [ the content of synthetic liquid 1 of the content of LaB<sub>6</sub> ] 13.5wt(s)% 0.5wt(s)% 14.6wt(s)%.

[0039] The bar coating machine was used and applied on the 3mm soda lime system glass substrate, this heat ray and application liquid for ultraviolet-rays cover film

formation were hardened in ordinary temperature, and the application film was obtained. The permeability of an application film is measured using the Hitachi spectrophotometer, and it is JIS. R 3106 is followed and it is ISO about visible light-transmittance ( $\tau_{uv}$ ) and solar radiation permeability ( $\tau_{ae}$ ). Ultraviolet-rays permeability ( $\tau_{uuv}$ ) was computed according to 9050. After carrying out application hardening, it was left in the interior of a room of ordinary temperature, and 30 days after, the film front face was observed and the existence of a bleed out was investigated. Moreover, the Taber abrasion tester performed the abrasion test of 250g of loads, and 50 rotations using wear ring CS12f, and the variation ( $\Delta H$ ) of Hayes before and behind an examination estimated the membranous abrasion strength.

[0040] The setting time to the set to touch was 40 minutes.  $\tau_{uv}$  is 75.1%,  $\tau_{ae}$  is 54.3%, and it turns out that there is visible light-transmission nature and there is cover ability of near-infrared light.  $\tau_{uuv}$  is 0.03% and the cover ability of ultraviolet radiation is also excellent.

[0041] The bleed out was not observed by the film surface of 30 days after. That is, since the benzophenone frame has joined together through alkoxysilane and an oxygen atom with an iso cyano group as shown in a general formula (1), the benzophenone frame which has ultraviolet-absorption ability stabilizes the above-mentioned application liquid in a binder, and it suppresses a bleed out.

[0042] By the presser foot stitch tongue, the firm film which a blemish does not attach at all is formed, and the degradation  $\Delta H$  value of Hayes by the Taber abrasion test became 19%.

[0043] The above evaluation result is collectively shown in Table 1. Also in the following examples and the example of comparison, same evaluation is performed and a result is shown in Table 1.

[0044] Example 2 ... 10g [ of CeB6 particles ] (46nm of mean particle diameters) and diacetone alcohol 86g and 4g of coupling agents for particle distribution were mixed, ball mill mixture was performed for 150 hours using the zirconia ball with a diameter of 4mm, and 100g of dispersion liquid of LaB6 particle was produced (B liquid).

[0045] 1g of dibutyltin dilaurate was added for 2, 2', 4, and 4'-tetrapod hydroxy benzophenone 57g and gamma-isocyanate propyltrimethoxysilane 77g for the beaker, and mixed stirring was performed by the mechanical stirrer. Although exothermic reaction occurred, neglect cooling was carried out as it was for about 1 hour, and the liquid of the dark reddish-brown containing the reactant target ultraviolet ray absorbent and hyperviscosity was obtained (synthetic liquid 2).

[0046] 13. Mixed stirring of the synthetic liquid [ of 5 g / 2 and 13.1g ] ethanol was carried out, and it dissolved uniformly. Furthermore, ethylene-glycol-monomethyl-ether 43g and ethylene-glycol-monobutyl-ether 25g were added as a solvent, 0.4g (monohydrate) of Para toluenesulfonic acid was added as a curing catalyst, and mixed stirring was carried out. Furthermore 5g of B liquid was added, mixed stirring was carried out, and a heat ray and the application liquid for ultraviolet-rays cover film formation were obtained. The solid content of application liquid is [ the content of synthetic liquid 2 of the content of CeB6 ] 13.5wt(s)% 0.5wt(s)% 14.6wt(s)%.

[0047] The bar coating machine was used and applied on the 3mm soda lime system glass substrate, this heat ray and application liquid for ultraviolet-rays cover film formation were hardened in ordinary temperature, and the heat ray and the ultraviolet-



rays cover film were obtained.

[0048] Example 1 of comparison ... tauv of a 3mm soda lime system glass substrate, tauv, and tauuv were also shown in Table 1 for comparison.

[0049] Example 2 of comparison ... As an ultraviolet ray absorbent, the lacquer type room-temperature-setting urethane resin (a solvent is 30% of solid contents at isopropyl alcohol) was carried out as 5g and a resin binder, and mixed stirring of isobutyl alcohol 48.3g and the propylene-glycol monoethyl ether 25g was carried out for 2, 2', 4, and the 4'-tetrapod hydroxy benzophenone as 16.7g and a dilution solvent. Furthermore 5g of A liquid was added, mixed stirring was carried out, and a heat ray and the application liquid for ultraviolet-rays cover film formation were obtained. The content of LaB6 of the solid content in this application liquid is 0.5wt(s)% 10.7wt(s)%. Moreover, the content of an ultraviolet ray absorbent is 5wt(s)%.

[0050] The bar coating machine was used and applied on the 3mm soda lime system glass substrate, this heat ray and application liquid for ultraviolet-rays cover film formation were hardened in ordinary temperature, and the heat ray and the ultraviolet-rays cover film were obtained.

[0051] The bleed out was seen by the observation 30 days after hardening. This shows 2 of an ultraviolet ray absorbent, 2', and that 4 and a 4'-tetrapod hydroxy benzophenone cannot be stabilized in a binder without a binder and the mechanism in which it reacts, and cannot exist.  $\Delta H$  is 32% and film intensity is weak.

[0052] Example 3 ... Mixed stirring of the ethanol of 9.0g of synthetic liquid 1 and 8.7g was carried out, and it dissolved uniformly. Furthermore, ethylene-glycol-monomethyl-ether 48g and ethylene-glycol-monobutyl-ether 25g were added as a solvent, 0.3g (monohydrate) of Para toluenesulfonic acid was added as a curing catalyst, and mixed stirring was carried out. Furthermore 5g of A liquid and 4g (solid-content 20wt%) of dispersion liquid of the FeOOH particle which is an inorganic ultraviolet ray absorbent were added, mixed stirring was carried out, and a heat ray and the application liquid for ultraviolet-rays cover film formation were obtained. The solid content in this application liquid is [ the content of synthetic liquid 1 of LaB6 content ] 9.0wt(s)% 0.5wt(s)% 10.8wt(s)%.

[0053] The bar coating machine was used and applied on the 3mm soda lime system glass substrate, this heat ray and application liquid for ultraviolet-rays cover film formation were hardened in ordinary temperature, and the heat ray and the ultraviolet-rays cover film were obtained.

[0054] tauuv is 0.31%, and even when there are few amounts of a hardenability ultraviolet ray absorbent, it turns out that sufficient ultraviolet-rays cover ability is obtained by combined use of an inorganic ultraviolet ray absorbent.

[0055] Example 3 of comparison ... Ethanol of 26g of synthetic liquid 1 and 12.5g was mixed, further, ethylene-glycol-monobutyl-ether 7.5g was added as a solvent, 0.25g (monohydrate) of Para toluenesulfonic acid was added as a curing catalyst, and mixed stirring was carried out. Furthermore, 2.5g was added, mixed stirring of the A liquid was carried out, and a heat ray and the application liquid for ultraviolet-rays cover film formation were obtained. The solid content in this application liquid is [ the content of synthetic liquid 1 of the content of LaB6 ] 53.3wt(s)% 0.51wt(s)% 54.7wt(s)%.

[0056] This heat ray and application liquid for ultraviolet-rays cover film formation had high viscosity, and was not able to be uniformly applied on the soda lime system glass

substrate which is 3mm.

[0057] Example 4 ... Mixed stirring of the ethanol of 13.5g of synthetic liquid 1 and 13.1g was carried out, and it dissolved uniformly. Furthermore, ethylene-glycol-monomethyl-ether 40g and ethylene-glycol-monobutyl-ether 25g were added as a solvent, 0.4g (monohydrate) of Para toluenesulfonic acid was added as a curing catalyst, and mixed stirring was carried out. Furthermore 5g of A liquid and colloidal silica (solvent is 30% of solid contents at isopropyl alcohol) 15.0g made from the Nissan chemistry were added, mixed stirring was carried out, and a heat ray and the application liquid for ultraviolet-rays cover film formation were obtained. The solid content in this application liquid is [ the content of synthetic liquid 1 of the content of LaB6 ] 12.1wt(s)% 0.45wt(s)% 19.1wt(s)%.

[0058] The bar coating machine was used and applied on the 3mm soda lime system glass substrate, this heat ray and application liquid for ultraviolet-rays cover film formation were hardened in ordinary temperature, and the heat ray and the ultraviolet-rays cover film were obtained. As for deltaH, the membranous abrasion strength has been improved by addition of colloidal silica at 14%.

[0059] Example 5 ... Mixed stirring of the ethanol of 13.5g of synthetic liquid 1 and 13.1g was carried out, and it dissolved uniformly. Furthermore, ethylene-glycol-monomethyl-ether 40g and ethylene-glycol-monobutyl-ether 25g were added as a solvent, 0.4g (monohydrate) of Para toluenesulfonic acid was added as a curing catalyst, and mixed stirring was carried out. 15.0g (solid-content 30wt%) of solutions which furthermore carried out the heating dissolution of 5g of A liquid and the acrylic resin by diacetone alcohol was added, mixed stirring was carried out, and a heat ray and the application liquid for ultraviolet-rays cover film formation were obtained. The solid content in this application liquid is [ the content of synthetic liquid 1 of the content of LaB6 ] 12.1wt(s)% 0.45wt(s)% 19.1wt(s)%.

[0060] The bar coating machine was used and applied on the 3mm soda lime system glass substrate, this heat ray and application liquid for ultraviolet-rays cover film formation were hardened in ordinary temperature, and the heat ray and the ultraviolet-rays cover film were obtained.

[0061] Addition of acrylic resin could adjust the viscosity of a heat ray and the application liquid for ultraviolet-rays cover film formation, and application nature was improved.

[0062] An example 6 - example 8 ... LaB6 particle of an example 1 was changed to PrB6 (53nm of mean particle diameters), NdB6 (66nm of mean particle diameters), and GdB6 (41nm of mean particle diameters), and also in the completely same procedure as an example 1, a heat ray and the application liquid for ultraviolet-rays cover film formation were produced, it was applied, and the heat ray and the ultraviolet-rays cover film were obtained.

[0063] Example 4 of comparison ... The mean particle diameter used the big and rough particle which is 212nm as CeB6, and also a heat ray and the application liquid for ultraviolet-rays cover film formation were produced and applied in the completely same procedure as an example 2, and the heat ray and the ultraviolet-rays cover film were obtained. Dispersion of the light is strong, and the obtained film has cloudiness, and is not fit for practical use.

[0064]

[Table 1]

	塗布液の組成 (wt%)			光学特性 (%)			膜強度	フット アウト	備考
	固形分	合成液	近赤外線 遮蔽材料	$\tau_v$	$\tau_e$	$\tau_{uv}$	$\Delta H(\%)$		
実施例 1	14.6	13.5	0.5	75.1	54.3	0.03	19	なし	
実施例 2	14.6	13.5	0.5	73.0	50.8	0.01	18	なし	CeBe、合成液 2 を使用
実施例 3	10.8	9.0	0.5	76.5	55.1	0.31	22	なし	FeOOH 添加
実施例 4	19.1	12.1	0.45	75.9	54.2	0.11	14	なし	エポキシ添加
実施例 5	19.1	12.1	0.45	75.8	54.1	0.12	23	なし	アクリル樹脂添加
実施例 6	14.6	13.5	0.5	75.8	52.9	0.03	20	なし	PrBe
実施例 7	14.6	13.5	0.5	76.3	53.5	0.04	21	なし	NdBe
実施例 8	14.6	13.5	0.5	76.0	52.2	0.02	19	なし	GdBe
比較例 1	-----	-----	-----	90.3	87.1	70.72	---	---	ガラス基板
比較例 2	10.7	0.0	0.5	78.4	56.2	0.03	32	あり	
比較例 3	54.6	53.6	0.51	-----	-----	-----	---	---	均一に塗布できない
比較例 4	14.6	13.5	0.5	-----	-----	-----	---	---	CeBe(粗大)、合成液 2 を 使用 曇りあり

[0065]

[Effect of the Invention] As shown above, using the new hardenability ultraviolet ray absorbent, by \*\*\*\*\* which adds 6 boride particle as a near-infrared light shielding material, it hardened in ordinary temperature and the heat ray and the application liquid for ultraviolet-rays cover film formation for forming a heat ray and an ultraviolet-rays cover film without the bleed out of an ultraviolet ray absorbent, and this have been offered. this invention enabled it to give a heat ray and an ultraviolet-rays cover function stable for a long period of time to a base material by the simple method.

[Translation done.]